Historical Papers
Communications historiques

Secrets Between Different Kinds of Friends: Canada's Wartime Exchange of Scientific Military Information with the United States and the USSR, 1940-1945

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Volume 21, numéro 1, 1986

Winnipeg 1986

URI : https://id.erudit.org/iderudit/030955ar
DOI : https://doi.org/10.7202/030955ar

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Éditeur(s)

The Canadian Historical Association/La Société historique du Canada

ISSN

0068-8878 (imprimé)
1712-9109 (numérique)

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Citer cet article

Avery, D. (1986). Secrets Between Different Kinds of Friends: Canada's Wartime Exchange of Scientific Military Information with the United States and the USSR, 1940-1945. *Historical Papers / Communications historiques*, *21*(1), 225–253. https://doi.org/10.7202/030955ar

Résumé de l'article

L'éclatement du deuxième conflit mondial, avec son emphase sur les armes modernes et les nouvelles technologies de défense, amena des changements considérables dans le rôle des scientifiques en Grande-Bretagne, aux États-Unis et au Canada — particulièrement pour les Canadiens. Désormais, par l'entremise du Conseil national de recherche et diverses agences de défense, ils purent avoir accès à des informations scientifiques hautement confidentielles dans le cadre de projets de recherche militaire menés conjointement par des Britannique et des Canadiens. Le Canada fut aussi indirectement affecté par les négociations complexes entre la Grande-Bretagne, les États-Unis et l'URSS sur les échanges en matière de sciences appliquées durant la deuxième guerre mondiale. De plus, plusieurs arrangements bilatéraux entre le Canada et l'Union Soviétique eurent de grands impacts sur l'échange de technologie militaire. Mais plus importantes encore furent les révélations en septembre 1945 à l'effet que les Soviétiques avaient exploité un système élaboré d'espionnage au Canada grâce auquel ils avaient obtenu beaucoup d'informations scientifiques militaires très secrètes. Le rapport subséquent de la Commission royale sur l'espionnage a eu un impact majeur sur le plan national et international.

Secrets Between Different Kinds of Friends: Canada's Wartime Exchange of Scientific Military Information with the United States and the USSR, 1940–1945

DONALD AVERY

Résumé

The outbreak of the Second World War, with the emphasis on new weapons and defence technology, brought about dramatic changes in the role of the scientist in Britain, the United States, and Canada. In many ways, Canadian scientists were most affected by these changes. Now, through the National Research Council and various defence agencies, they were able to gain access to highly confidential scientific data through the medium of joint British and Canadian research projects. Equally important was the extent that the British connection made it possible for Canadian scientists to become involved in sophisticated American military projects. Canada was also indirectly affected by the complex negotiations between Britain, the United States and the USSR on applied science exchanges during World War II. In addition, there were a variety of bilateral arrangements between Canada and the Soviet Union which had important implications for the exchange of military technology. But even more important were the revelations in September 1945 that the Soviet Union had been operating an extensive espionage system in Canada which had obtained considerable "Top Secret" scientific military information. The subsequent report of the Royal Commission on Espionage had major national and international ramifications.

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L'éclatement du deuxième conflit mondial, avec son emphase sur les armes modernes et les nouvelles technologies de défense, amena des changements considérables dans le rôle des scientifiques en Grande-Bretagne, aux États-Unis et au Canada — particulièrement pour les Canadiens. Désormais, par l'entremise du Conseil national de recherche et diverses agences de défense, ils purent avoir accès à des informations scientifiques hautement confidentielles dans le cadre de projets de recherche militaire menés conjointement par des Britannique et des Canadiens. Le Canada fut aussi indirectement affecté par les negociations complexes entre la Grande-Bretagne, les États-Unis et l'URSS sur les échanges en matière de sciences appliquées durant la deuxième guerre mondiale. De plus, plusieurs arrangements bilatéraux entre le Canada et l'Union Soviétique eurent de grands impacts sur l'échange de technologie militaire. Mais plus importantes encore furent les révélations en septembre 1945 à l'effet que les Soviétiques avaient exploité un système élaboré d'espionnage au Canada grâce auquel ils avaient obtenu beaucoup d'informations scientifiques militaires très secrètes. Le rapport subséquent de la Commission royale sur l'espionnage a eu un impact majeur sur le plan national et international.

In its dramatic July 1946 report, the Royal Commission on Espionage provided a litany of charges about Russian espionage operations in Canada. Although the commission acknowledged that the evidence provided by Igor Gouzenko — basically only covering the last three months of the war — made it "impossible to say how much information was obtained, or of what it consisted," the commissioners nevertheless concluded that the damage to Western military security was extensive. At the very minimum, the top secret military and scientific information the Soviets had acquired in Canada complemented the "body of data" which they had already obtained "in England and...in the United States." Moreover, the extensive activities of the Russian Military Intelligence (GRU) in itself confirmed that "the information sought was considered of the greatest importance by the Russian espionage leaders, and that alone might be a fair test of the question of value." Finally, and in some ways most importantly, there was the transmission of "much secret and valuable information shared by Canada, the United Kingdom and the United States."

> From the beginning there was the closest cooperation in scientific research between Canada, the United Kingdom and later, the United States. While some secrets were not fully shared, as in the case of some details concerning the atomic bomb, the results of continuing research work by scientists in one country was in almost all cases at once communicated to their opposite numbers in the other two. Work carried to a certain stage in one would be further advanced in another; and experimentation and research did not stop when a reasonably satisfactory result appeared to have been achieved; further improvements were sought and frequently made.[1]

The report then went on to refer specifically to the most important areas of cooperative military research: atomic energy, radar, Asdic/Sonar, explosives (RDX), and the VT or proximity fuse. In conclusion, commissioners Kellock and Taschereau made pointed reference to the fact "that the bulk of the technical information sought by the espionage leaders related to research developments, which would play an important part in post-war defences of Canada, the United Kingdom and the United States."[2] Who would these defence systems be directed towards? The royal commission left little doubt that the prime candidate was the Soviet Union.

It is with the war years, however that this paper proposes to study the connection between alliance military cooperation and espionage. In order to carry out this task it is necessary initially to examine the various structures which emerged as a result of British, Canadian, and American military and scientific coordination and the role which Canada assumed in this context. Reference will also be made to the status of the USSR and the allied exchange system. Then an attempt will be

1. Canada, *Royal Commission to Investigate the Facts Relating to and the Circumstances Surrounding the Communication, by Public Officials and Other Persons in Positions of Trust, of Secret and Confidential Information to Agents of a Foreign Power* (Ottawa, 1946), 614–20. (Hereafter Royal Commission, Espionage, *Report*.)
2. Ibid., 617–19.

made to assess Canada's involvement in some of the most critical sectors of scientific military technology. Finally, the paper will focus on the ways that the Soviet espionage system operated in Canada and how successful it was in obtaining top secret information.

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The years from 1940 to 1945 represent a major transition for Canadian military technology and for the role of scientists in the development of weapons systems. One reason for this phenomenon was the impact of the British decision to shift some of their research facilities to Canada in 1940 because of their desperate military situation and their need to obtain more effective access to American technological and economic resources.[3] Both the chemical warfare operation at Ottawa and Suffield, and the establishment of the Montreal atomic research laboratory in 1943 are important examples of this trend. Canadian scientists, many of whom had been seconded to the National Research Council (NRC) and to various defence agencies, were thus able to gain access to highly confidential scientific data through the medium of joint British and Canadian military research projects. Equally important was the extent to which the British connection made it possible for Canadian scientists to become involved in sophisticated American military projects, especially after the British scientific and technical mission under Sir Henry Tizard arrived in North America in August of 1940.[4]

Much has been written about the importance of the Tizard mission in integrating defence research, development, and production between Britain and the United States. What was the effect on Canada? Obviously, the Canadian government was delighted with the close cooperation between its two closest allies. There was also satisfaction that the Tizard mission had consulted with representatives of the National Research Council prior to their visit to Washington, and that three Canadian representatives, Dean C. J. Mackenzie, Brigadier-General Kenneth Stuart, and Air Vice-Marshall Stedman, were invited to join the British and American delegations after the first round of talks.[5]

Yet being consulted didn't mean being equal, and scientists and military officials quickly discovered that theirs was a subordinate status. The junior partner role was institutionalized with the formation of the British-American Combined Chiefs of Staff in January of 1942. As the supreme high command of the Anglo-American global military effort, the Combined Chiefs of Staff included "the professional head of three United States armed forces. . . and. . . three high officers representing and acting under the general instructions of the British Chiefs of Staff. There was, however, no formal Canadian representative. Despite protests from the

3. Wilfrid Eggleston, *Scientists At War* (Toronto, 1950), 5–67.
4. Wilfrid Eggleston, *National Research in Canada: The NRC, 1916–1966* (Toronto, 1978), 116–86.
5. Ibid., 164–66; Ronald Clark, *Tizard* (Cambridge, 1965), 112–200; Daniel Kevles, *The Physicist* (New York, 1979), 300–28.

Canadian government that having to work through the British Joint Staff in Washington was both a slur to national pride and an inefficient procedure, the status quo was maintained.[6] Equally troubling from a Canadian point of view was exclusion from the important Combined Munitions Assignment Board which had the task "of coordinating the assignment of weapons and equipment to various theatres in accordance with the needs of strategy."[7]

Fortunately, some of the organizations established under the Ogdensburg Agreement of 1940 and the Hyde Park Declaration of 1941 facilitated direct military, economic, and scientific interaction with the United States. Of particular importance was the Permanent Joint Board of Defence, and economic bodies such as the Material Co-ordination Committee and the Joint War Production Committee which provided "for the coordination and rational integration of the war industries of Canada and the United States."[8]

A third alliance commitment which affected Canada's military and scientific interests was the September 1942 British accord with the Soviet Union. This agreement provided for a sharing of information on all "weapons, devices, or processes which... are... or in future may be deployed... for the prosecution of the war against the common enemy." A rider clause made it possible for either country to withhold specific requested material, but it had to justify this decision. Between 1942 and the summer of 1944 the British government provided the USSR with a wide range of war material and secret weapons despite the fact that the flow was essentially one way:

> Churchill was offering what he regarded as substantial aid, for he was convinced — largely by British successes with radar in 1940 — that applied science was to be a major factor in the war. The Americans were already making effective military use of radar and other British inventions, under terms of an agreement worked out in 1940 and 1941, whereby the two countries

6. Colonel Stanley Dziuban, *Military Relations Between the United States and Canada* (Washington, 1959), 15–65; C.P. Stacey, *Arms, Men and Governments: The War Policies of Canada, 1939–45* (Ottawa, 1970), 485–528. The Combined Chiefs of Staff Committee held two hundred formal meetings, mostly in the Washington headquarters. However, eighty-nine of these were held elsewhere "at which Mr. Roosevelt and Mr. Churchill were normally present and exercised dominant influence." Ibid., 162.
7. Stacey, *Arms*, 162. There were four other major bodies working under the auspices of the Combined Chiefs of Staff: the Combined Raw Materials Board, the Combined Food Board and the Combined Production and Resources Board. Canada was ultimately admitted to the latter two organizations.
8. Dziuban, *Military Relations*, 58–109; Hugh L. Keenleyside, *On the Bridge of Time* (Toronto, 1982), 77.

> arranged to pool their scientific and technical information. Presumably, a similar sharing with Russia would substantially strengthen her forces, too.[9]

One major problem with this arrangement was that the American government did not follow the lead of its British ally and refused to participate in any such exchange with the Soviets on the grounds that it "would force the disclosure of highly sensitive information without providing anything of value in return." Moreover by late 1942 Roosevelt's scientific advisers warned him that American involvement in the Anglo-Soviet accord "might provide Russia with some of the secrets of the [atomic] bomb project."

It was an extremely awkward situation for the British. On the one hand the Russians continually complained that they were not receiving what had been promised in the 1942 accord. The fact that "a fair quantity of secret information had already found its way to Russia, and plans were to send a top-level scientific mission to Moscow to make even more important disclosures," did not mollify the Kremlin. For their part, the Americans took great exception that the British had divulged such a range of scientific secrets and demanded that in future "the Russians should not get any information on equipment they did not already possess."[10] The first Quebec Conference of August 1943, with its emphasis on the exchange of information among allies, did much to soften the American position.[11] Even more important was the 1944 decision by President Roosevelt and the Joint Chiefs of Staff that Soviet military assistance against Japan could save thousands of American lives. Ironically, after August of 1944, when a common disclosure policy towards the USSR had been devised, it was the British who were now calling for restraint and insisting that disclosures should only be on a reciprocal basis. By January of 1945 the flow of scientific information from the United Kingdom to the Soviet Union had virtually stopped. In contrast American generosity continued unchecked until October, well after the defeat of Japan.[12]

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9. Churchill's justification for this accord was quite simple: given the desperate military situation in June of 1941 Britain would accept an alliance with the devil if necessary to defeat Nazi Germany; and since the second front was impossible in 1942, in order to help the Russians "in killing more Germans," it was necessary to provide them with military technology. See E.H. Beardsley, "Secrets Between Friends: Applied Science Exchange Between the Western Allies and the Soviet Union During World War II," *Social Studies of Science* 7 (1977): 440–49.
10. Ibid., 449–50; Martin Sherwin, *A World Destroyed: The Atomic Bomb and the Grand Alliance* (New York, 1977), 71–89. In December 1942 both James Conant and Vannevar Bush convinced President Roosevelt that this Russian threat further justified limiting British access to America's nuclear research.
11. This subject has been extensively discussed from the American, British and Canadian perspectives. See Sherwin, *A World Destroyed*; Margaret Gowing, *Britain and Atomic Energy, 1939–1945* (London, 1965), and Robert Bothwell, *Eldorado* (Toronto, 1984).
12. Beardsley, "Secrets," 453–55 Vannevar Bush in his book, *Pieces of the Action* (New York, 1970) claims that in 1945 Roosevelt wanted to send a scientific mission to Russia in order "to exchange information on weapons. I was appalled and a matter of fact ultimately side tracked this onto a mission of military medicine." Ibid., 140.

Sharing the secret of the atomic bomb with the Russians was quite another matter and both Roosevelt and Churchill were convinced that this would be a grave mistake. Their motives were, however, not the same. While both believed that the atomic bomb would be an essential military deterrent in controlling Soviet imperialism, each leader approached the problem from quite a different perspective. For Churchill, keeping the Soviet Union out of the atomic club coincided with his general emphasis on a favourable postwar balance of power in Europe. The British also seemed more inclined to believe that the Russians were not that far behind the Western Allies in the development of atomic weapons. In April of 1943, for example, Lord Cherwell, Churchill's chief scientific adviser, suggested to his prime minister that the Western Allies "must always remember that the Russians, who are peculiarly well equipped scientifically for this kind of development, may be working on the Tube Alloys [atomic bomb] project somewhere beyond the Urals and making great progress."[13] In contrast, Roosevelt did not appear to have been concerned about the possibilities of a Russian atomic bomb even though he was aware as early as 1942 that the Soviets were thoroughly briefed through their espionage operation about the general goals and administrative organization of the Manhattan Project. Martin Sherwin, one of the leading historians of this subject, has suggested other reasons why Roosevelt was reluctant to inform Stalin about the status of the Anglo-American atomic project:

> His concern, perhaps, was for maintaining the tightest possible secrecy against German espionage. Or, he may have concluded after considering [Niels] Bohr's analysis, that Soviet suspicion and mistrust would only be further aroused if Stalin were informed of the existence of the project without promptly receiving detailed information about the bomb's construction. The possibility also exists that Roosevelt did not believe either Congress or the American public would approve a policy giving the Soviet Union any information about the new weapon. Finally, Roosevelt may simply have thought that the spring of 1944 was not the proper moment for such an initiative.[14]

Canada was indirectly affected by the complex negotiations between Britain, the United States and the USSR on applied science exchanges during World War II. In addition, there were a variety of bilateral arrangements between Canada and the Soviet Union which had important implications for the exchange of military technology. One of these was the extensive material support which was provided

13. Gowing, *Britain and Atomic Energy*, 72–116; Sherwin, *A World Destroyed*, 82.

14. Sherwin, *A World Destroyed*, 104. In the summer of 1944 the distinguished atomic scientist Niels Bohr had unsuccessfully attempted to convince Roosevelt and Churchill of the futility of keeping the "atomic secret" and that a disastrous atomic arms race was inevitable in the postwar period unless some arrangements were made with the USSR. By June 1945 both the American secretary of war, Henry Stimson and the scientific panel of the Manhattan Project had suggested that the Russians be officially informed about some of the general characteristics of the atomic bomb and that negotiations for its postwar international control be initiated. It was, however, not until the Potsdam Conference in late July 1945 that President Truman informed the Soviet leader that the United States "had a weapon of unusual destructive force." Ibid., 227.

through the Mutual Aid Act. First passed by Parliament in May of 1943, it provided for the delivery of "planes, tanks, wheat, bacon and lumber to all the Allies," and, unlike previous arrangements, included the USSR. By the end of the war Canada had supplied the Soviet Union with approximately $167.3 million, worth of food, medical supplies, and war material.[15] Another major development was the February 1942 agreement to have ministerial diplomatic exchanges between the two countries. In September of 1942 the Soviet mission arrived in Ottawa, followed one month later by Ambassador Feodor Gousev.[16] Early in 1943 Colonel Nikolai Zabotin assumed his duties as military attaché, a job which included streamlining the delivery of appropriate military technology to the USSR. The ground rules for this exchange were determined by the Canadian War Cabinet and by the liaison division of the Department of National Defence. They were as follows:

> It is pointed out that Military Attachés have accredited diplomatic status and that apart from routine duties their recognized function is to obtain military information by all proper means and to such extent as information may be volunteered them or granted upon request.... While the exchange of information, particularly with Allied Countries is on a wide scale nevertheless it should be borne in mind that much of Canada's military development is closely linked with other British sources and it is encumbent to exercise responsibility in ensuring that the security of such information is properly recognized.[17]

The director of military operations and planning, Colonel J. Jenkins, had the primary responsibility of dealing with Soviet requests for military and scientific information. It was not an arduous task. Colonel Jenkins was later to inform the Royal Commission on Espionage "how reasonable were...Zabotin's...official requests." They had all been quickly approved.[18]

By the time that Colonel Jenkins had to deal with Colonel Zabotin the Canadian armed forces had devised an elaborate classification system for protecting military secrets. All documents were placed into one of four categories: top secret, secret, confidential, and restricted. Naturally, top secret information was afforded

15. Aloysius Balawyder, "Canada in the Uneasy War Alliance," *Canadian-Soviet Relations, 1939–1980*, ed. Aloysius Balawyder (Oakville, 1981), 1–14; Donald Page, "Getting to Know the Russians, 1943–1948," ibid., 15–35. The mutual aid agreement was cancelled in September 1945.

16. In 1942 Dana Wilgress was sent to the temporary Soviet capital of Kuibyshev as envoy extraordinary and minister plenipotentiary; in 1943, as the military situation improved, he moved to Moscow where he remained as Canadian ambassador until 1947.

17. Royal Commission, Espionage, *Report*, Exhibit 444, DND Directive, 23 Dec. 1943, Colonel Jenkins for Chief of Staff.

18. Ibid., 621–22. Most of the official requests were quite trivial: training pamphlets, weather reports, the rank structure of the Canadian Army and the like. The only exceptions were some publications "dealing with the operation and maintenance of radar sets released to the Soviet Union." In 1945 Colonel Zabotin had briefly considered trying to recruit Colonel Jenkins for his spy network, but discarded the idea on the grounds that Jenkins was "a reserve officer and must soon retire." Ibid., 623.

the highest security on the grounds that such disclosures "would cause exceptionally grave damage to the nation." In 1943 it included the following topics:

a) plans or particulars of future military operations;

b) particulars of important manoeuvers by Canadian armed forces or convoys;

c) important political documents "dealing with such matters as negotiations for alliances and the like;"

d) information of the "methods used or success obtained by our Intelligence Services and Counter-Intelligence Services or which would imperil secret agents;"

e) "important particulars of cryptography and cryptanalysis;"

f) "critical information on new and important munitions of war, including approved scientific and technical developments."[19]

Yet in many ways it was the United States which by 1943 basically determined what military scientific information would be exchanged within the alliance. Although there was regular consultation with the British, and to a much lesser extent the Canadians, most of the classification of weapons was carried out by the American Office of Scientific Research and Development (OSRD) and the Joint Intelligence Committee.[20] A November 1945 memorandum of the United States Joint Chiefs of Staff provides a useful example of how specific weapons systems were categorized:

a) chemical warfare: top secret: "As this weapon was not used in the war, no information regarding it should be released, except as a defensive measure;"

b) explosives–RDX: secret: "Limited Access;"

c) guided missiles: top secret: "No information should be released;"

d) VT, Proximity Fuse: top secret: "Information regarding it should not be released under any circumstances;"

e) radar: top secret and secret: "Clearance by the Armed Forces and OSRD is required. . . .The combined agreement with the establishment of security classification of radio, radar and RCM equipment and information. . . has been abrogated."[21]

19. Royal Commission, Espionage, *Report*, Exhibit 64, Memo, Deputy Minister Army, R.P. Brown, 10 April 1944; Canadian Army Routine Orders, Secrets, 4278–4280, 27 March 1944.

20. Irwin Steward, *Organizing Scientific Research for War: The Administrative History of the Office of Scientific Research and Development* (New York, 1948), 63–134.

21. National Archives (Washington), Modern Military Branch, Joint Chiefs of Staff Collection, file 6-24-42 #2, memorandum, Joint Chiefs of Staff, 9 Nov. 1945. (Hereafter NA, JCS Collection.)

There was, of course, no mention of the secrets of the atomic bomb project because it did not fall directly within the jurisdiction of either the OSRD or the Joint Intelligence Committee. Instead, policy decisions and broad security matters were administered by the Combined Policy Committee. This organization was created by the August 1943 Quebec Agreement to facilitate the interchange of atomic energy information between the United States, Britain, and Canada.[22]

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In order to test the major hypothesis about Canadian-American cooperation in military technology, it is necessary to examine the role Canada assumed in the development of specific weapons. This will entail an analysis of what information was obtained through direct arrangements with the United States, and what was obtained through the British connection. Another dimension which requires explanation is the extent to which the research and development of new weapons was advanced through the joint efforts of Canadian and American scientists both in their respective laboratories and through regular consultation. Attention will also be given to the various security measures which affected communications between Canadian and American scientists.

The National Research Council was the organization which had the major responsibility of supervising military research activities by Canadian scientists. It is important, therefore, to appreciate the role which the NRC assumed as liaison with the Office of Scientific Research and Development (OSRD) and other American scientific military bodies. No less important was the NRC's pivotal position within the Canadian scientific military establishment, especially in facilitating the transformation of scientific research and development into sophisticated weapons for the Canadian armed forces. In this work it was greatly assisted by the Army Technical Development Board, created in March of 1942 to promote, research, design, experiment, and develop new weapons, and "to coordinate all Army development projects except in such fields as chemical warfare and radar where standing boards and committees were already functioning."[23]

22. Gowing, *Atomic Energy*, 170–72. The Canadian representative on the six-man committee was C.D. Howe, minister of munitions and supply. Dean C.J. Mackenzie, acting president of the National Research Council, acted as Howe's surrogate at many of the meetings. Robert Bothwell and William Kilbourn, *C.D. Howe* (Toronto, 1979), 168–69.

23. The NRC liaison activity in Britain was effectively carried out in the period from 1939 to 1943 by Dr. L.E. Howlett. It had a mandate "to deal not only with Munitions and Supply matters, but also with the Air Force, the Admiralty and 'the medical people'." Howlett was greatly assisted by General McNaughton on an informal basis; Eggleston, *National Research*, 211–12. The liaison work with the United States involved a number of NRC administrative units; Stacey, *Arms*, 508.

The highly secret radar project of 1940–41 was the first major undertaking by the National Research Council in joint military research projects with British and American scientific organizations.[24] In particular, there was considerable Canadian exchange with the American radar project (Rad Lab). The American programme had greatly expanded after the Tizard mission and by the end of 1942 its budget had reached $1,150,000 monthly, and its staff had multiplied to almost two thousand people.[25] Although most of the contact between the NRC and the radiation laboratory was channelled through the British, there was still a significant degree of contact between Canadian and American radar physicists. Certainly the evidence presented to the Royal Commission on Espionage showed that scientists at the NRC had attended many high-level meetings of the Rad Lab and had access to highly classified information.[26]

Safeguarding radar secrets was of particular concern to the Canadian government. In July of 1941, for example, the General Staff issued instructions to all military personnel "that no discussion relating to detection of aircraft by means of radio are to be carried out unless such are necessary in connection with duties being informed." The following year there was an attempt to ensure that the physical components of radar equipment be given the utmost security, especially during field testing:

> On account of the secrecy concerning the designs of Magnetrons used in R.D.F. equipment and the danger of compromising the principles involved, it is imperative that no Magnetrons either serviceable or unserviceable be permitted to fall into unfriendly hands, or into the hands of personnel not acquainted with the degree of secrecy with which the evidence should be handled. Unserviceable Magnetrons should on no account be turned into ordinary salvage.[27]

In the fall of 1944 more comprehesive guidelines were issued governing various aspects of top secret radar research:

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24. Eggleston, *National Research*, 186–93. Even prior to 1939 the NRC had worked closely with the research branches of the Department of National Defence. By 1945 the Canadian Army was operating six research and development establishments, while both the Royal Canadian Navy and the RCAF maintained their own specialized research operations. All these organizations worked closely with the NRC. Stacey, *Arms*, 508–09.

25. Kevles, *Physicists*, 306–07. By the end of the war the production costs for the radiation laboratory reached some 1.5 billion dollars, a cost somewhat comparable to the two billion dollars spent on the Manhattan Project. Indeed, as Daniel Kevles put it, "The atom bomb only ended the war. Radar won it." Ibid., 308. NA, JCS Collection, file 11-2-42, Director L.A. Dubridge to Combined Chiefs of Staff, Washington, 2 Nov. 1942.

26. James P. Baxter, *Scientists Against Time* (Boston, 1946), 41–110; Royal Commission, Espionage, *Report*, 618.

27. Royal Commission, Espionage, *Report*, Exhibit 64, Memorandum, Colonel DMO & I, 14 July 1941; ibid., Memorandum, Major A. Bebrisay, Directorate of Artillery, 31 Aug. 1942.

> Equipment... which will perform an operational function of war for which Radar had not previously been used;
>
> Precise operational frequencies in association with the code used to denote these frequencies....
>
> Information concerning details of new radio countermeasures not yet in operation (in any frequency band)....
>
> Radar information disclosing details of future major operations irrespective of the radio frequency band employed.[28]

Physicists at the National Research Council were involved in the development of the radio proximity or VT fuse. The Tizard mission had been instrumental in transforming separate British and American VT research undertakings into a fully coordinated joint project. Plans were subsequently made for the mass production of fuses in the United States with both the American and British armed forces receiving their allotment of naval, ground, fragmentation, and antiaircraft VT shells from a common pool administered by the Combined Munitions Assignment Board.[29] In the development of VT shells Canadian scientists made an important contribution, as the following 1941 progress report from Dean Mackenzie shows:

> We have been working on the development of a very rugged radio tube which can be inserted in a shell and take 36,000 g and stand also the necessary centrifugal forces. Such a tube has been developed and is being put into production, and is awaiting only the development of the radio devices to complete the proximity fuse.[30]

By June of 1944 American scientists of the Army Bureau of Ordnance and the Johns Hopkins Laboratory of Applied Physics, the major participants in VT research, had another challenge: how to use the proximity fuse against the German VT rocket. This challenge was successfully met and by the fall of 1944 VT fuses were "destroying ever increasing percentages of flying bombs." Equally important was their use in the Western European land battle, especially the December 1944 Battle of the Bulge. In the Pacific theatre VT fuses were successfully deployed in artillery bombardments, in launched rockets, and in antiaircraft shells against Japanese kamikaze planes.[31] Vannevar Bush, director of the Office of Scientific Research and Development and Roosevelt's main science adviser, described the VT project in the following way: "Plants all over the country made parts; most of them did not know

28. Ibid., Instructions for the Security Classification of Radar Equipment, Documents and Information, 14 Nov. 1944.
29. The fuse consisted of a small but incredibly rugged radio transmitter which, when installed in a bomb or projectile, sent out high frequency radio waves. When fired it sent out high frequency radio waves which caused the detonation of the explosive when they bounced back from an enemy aircraft, vehicle, or the earth. *Army Ordnance*, Jan. 1946," The VT Fuze," by Colonel Harold Morton, member of the U.S. Sub-Committee on Logistics, Joint Chiefs of Staff.
30. Eggleston, *National Research*, 183.
31. Colonel Morton, "The VT Fuze."

what for. Others assembled under the tightest sort of security measures. The Russians found out a great deal about the atomic bomb during the war, all, in fact they needed to know. I do not think they even knew this fuse development was going on."[32]

In this instance, Bush was being overly confident. While the security procedures appeared to have been reasonably effective, evidence provided by the Royal Commission on Espionage showed that by May of 1945 Soviet military intelligence had obtained certain theoretical information about the VT fuse in both Canada and the United States.[33] Moreover, with the end of the war it became increasingly difficult to guard these secrets. A February 1946 report of the American Joint Intelligence Committee alleged that there had been "so many breaches of security relative to the proximity fuse that there is little technical information which has not been published in one form or another... only the frequencies at which proximity fuses operate is not generally known."[34]

One of the most "secret" projects that involved Canadian scientists was the elaborate research into the defensive and offensive techniques of chemical warfare. In many ways allied research into the offensive use of persistent and nonpersistent chemicals for warfare was an extension of work initiated during World War I. According to one authority, German nerve gases (Tabun/Sarin) were "the only really significant advances in CW since the development of mustard gas." Still, the threat of a German attack using even the known chemical warfare agents was a terrifying possibility which spurred the British and Americans into frenzied research and development between 1939 and 1945.[35] By 1941 Canada had become a major player in this particularly inhumane form of warfare with the transfer of British technology and personnel to the Rockliffe (Ottawa) chemical warfare laboratories and to the newly established Suffield Experimental Station. It was here that the most lethal gases, phosgene, cyanide hydrogen, toxic alkaloids, and mustard gas were chemically analyzed, produced, and tested. At both the laboratory and testing stage Canadian scientists worked closely with American chemical warfare specialists.[36] In part this confidence was based on the effective safeguards which the Canadian programme had implemented in protecting its own secrets from Nazi espionage. All chemical warfare personnel were thoroughly checked by both the

32. Vannevar Bush, *Pieces of the Action* (New York, 1970), 109.
33. Royal Commission, Espionage, *Report*, 617–20.
34. NA, JCS Collection, file 6-24-42, memo, 9 Nov. 1945 and file 8-4-43, report, 19 July 1946.
35. Leo Brophy et al, *United States Army in World War II, The Chemical Warfare Service: From Laboratory to Field* (Washington, 1959), 10–74. NA, JCS Collection, file 8-27-42, report, 12 March 1943.
36. NRC, vol. 106, "CW File," Major E.A. Flood to Mackenzie, March 1941; Eggleston, *National Research*, 155–58; Captain D.J. Goodspeed, *DRB; A History of the Defence Research Board of Canada* (Ottawa, 1958), ch. 9. At the political level, however, Canada had very little influence on American plans to use chemical and biological weapons either in retaliation for German or Japanese attacks, or in a first use situation such as was recommended prior to the American assault on Iowa Jima in 1944.

RCMP and military intelligence. The Rockliffe and Suffield Station facilities were declared restricted areas, and all chemical warfare material was safely guarded. In July of 1945 the Canadian director of chemical warfare strongly urged his superiors to maintain these stringent security measures as a guarantee that the exchange system with the United States would be extended:

> It is felt that executive control by D.C.W. & S. has been one of the reasons that this Unit was able to carry out the important functions with which it was entrusted in so satisfactory a manner that it excited the admiration of the United States Chemical Warfare Service by reasons of its efficient operation.[37]

Much has been written about the important role which Canadian chemists George Wright, James Ross, Otto Maas, and Raymond Boyer played in the research and development of RDX, "the most powerful of chemical explosives." Within Canada RDX research involved a wide range of government and university resources: the NRC Chemistry Committee, the NRC Committee on Explosives, the inspection services of the Canadian army, the explosives testing centre at Valcartier, and the chemistry departments of McGill and the University of Toronto. By July of 1942 a suitable RDX formula had been devised and large-scale production was begun in both Canada and the United States. In 1943, the Shawinigan chemical plant managed to increase its output to 350 tons of RDX a month, while the Tennessee East plant developed a capacity of 340 tons of RDX per day.[38] A large percentage of this enormous American production of RDX was allocated to the British and Canadian armed forces by the Combined Munitions Assignment Board.

During the last two years of the war Canadian, American, and British scientists and technicians experimented with new forms of explosives and propellants. In Canada this work was coordinated by the Armament Research and Development Establishment of the Department of National Defence (CARDE), a new organization created in 1945. Part of CARDE's mandate was to centralize munitions production in Canada; the other was to implement more effective security procedures.[39]

As early as September of 1941 representatives of the British Supply Council had expressed concern that Canadian security measures were not adequate "to prevent...any discoveries made by men working with the N.R.C. being used against us."[40] While the security measures against Nazi infiltration were effectively enforced, there was not the same success in keeping secret information from the

37. Brophy, *Chemical Warfare*, 36–37. At Suffield not only were the particular chemical warfare agents tested, but also various delivery systems: aircraft spraying, large scale bomb releases, and gas shells. NRC, vol. 106, "CW Research," Major Gay Report, 5 July 1946.
38. Eggleston, *Scientists At War*, 80–81; Baxter, *Scientists Against Time*, 47–89.
39. Eggleston, *National Research*, 198–201; Goodspeed, *Defence Research Board*, 111–23; testimony of Colonel Van Steenburg, Royal Commission, Espionage, transcript.
40. NRC, vol. 106, "RX file," R.P. Linstead, British Central Scientific Office to Dr. Otto Maas, 18 Sept. 1941.

Soviet Union. This was particularly true after 1943 with the enactment of the Canadian Mutual Aid programme and the establishment of a Soviet military mission in Ottawa. This is not to say, however, that the Canadian government favoured disclosure of its major military or scientific secrets. Even in 1944 officials such as J.R. Donald, director of the Explosives and Chemical Branch of the Department of Munitions and Supply, tried to deny the Soviets full access to the most advanced RDX research on the grounds that much of this information had been secured from British and American sources.[41] In May of 1945, Colonel Van Steenburg, the director of the Army Armaments and Munitions Research Branch, justified his delay in carrying out the postwar declassification of top secret documents for similar reasons:

> a) The majority of the items included in the list at the suggestion of this Directorate are purely Research and Development Projects whose status is not clear at this time.
>
> b) The difficulty of determining which equipts [sic] of CDN. [sic] origin in the Secret List may be utilized in the War against Japan, in the light of decision to equip CDN Forces with U.S. Arms and equipt.[42]

The debate over scientific information exchange also had an enormous impact on the American–Anglo-Canadian atomic energy undertaking. In some ways the security problems associated with the atomic bomb had many similarities to those encountered in protecting other allied weapons systems. But there were also important differences which set the Manhattan Project apart.[43] The Anglo-American refusal to share any atomic secrets with the USSR was obviously the most crucial distinction. This British-American policy decision had been codified in article five of the 1943 Quebec Agreement: "we will not either of us communicate any information about Tube Alloys [the British code name for the atomic project] except by mutual consent." Article five of the agreement set forth in some detail the

41. *Gazette* (Montreal), 4 Dec. 1947, citing the testimony of J.R. Donald at the trial of Dr. Raymond Boyer. Another witness claimed that he had personally shipped from the St. Maurice plant "thousands of tons of RDX... sent to Russia under the Mutual Aid Plan;" cited ibid., 6 Dec. 1947.

42. Royal Commission, Espionage, *Report*, Exhibit 63, Colonel Van Steenburg to Major F.L. Williams, Military Intelligence, 28 May 1945. In the spring of 1945 Soviet military intelligence were informed of the research work being conducted with a variety of new propellants: "They are using a new explosive 'Dina' mixed with RDX.... Dina is intended as an alternative to nitro-glycerin. Americans are said to be very interested in one of these new propellants called 'Albanite'." Ibid., Exhibit 17E, report of Gordon Lunan, including information provided by Bacon [Israel Halperin], 19 April 1945.

43. By October 1942 the top policy group of science administrators, presidential advisers and military offices included Dr. Vannevar Bush, director of OSRD; James Conant, chairman of the National Defence Research Committee; Brigadier General Leslie Groves, officer in charge of the Manhattan Project, and Henry Stimson, secretary of war (usually represented by his aides Harvey Bundy and George Harrison). The Military Policy Committee, an adjunct of the Manhattan Project, was a major link with the Joint Chiefs of Staff; Sherwin, *A World Destroyed*, 44–47.

guidelines which the newly established Combined Policy Committee was expected to follow:

> b) There shall be complete interchange of information and ideas on all sections of the project between members of the Policy Committee and their immediate technical advisers.
>
> c) In the field of scientific research and development there shall be full and effective interchange of information and ideas between the two countries engaged in the same sections of the field.
>
> d) In the field of design, construction and operation of large-scale plants, interchange of information and ideas shall be regulated by such ad hoc arrangements as may, in each section of the field, appear to be necessary or desirable if the project is to be brought to fruition at the earliest moment. Such ad hoc arrangements shall be subject to the approval of the Policy Committee.[44]

The actual task of protecting the secrets of the Manhattan Project was the reponsibility of General Leslie Groves. Ostensibly the elaborate security procedures were a defence against German espionage, but in Groves' mind the primary threat emanated from the Soviet Union. "There was never from about two weeks of the time I took charge of this Project any illusion on my part but that Russia was our enemy." As a result, every scientist with a left-wing background was brought under surveillance by the Manhattan Project's security section, and some were removed.[45] The major vehicle for maintaining secrecy was the rigid compartmentalization system which dictated that the flow of scientific information among scientists be on a "need to know" basis.[46] In his own folksy way Groves explained what he meant by compartmentalization: "Just as outfielders should not think about the manager's job of changing pitchers, and the blocker should not worry about the ball carrier fumbling, each scientist had to be made to do his own work." Not surprisingly, this narrowly defined "need to know" infuriated American scientists and was a

44. Ibid., 86, 104. Canada was a member of the CPC and involved in the June 1944 agreement and declaration of trust which specified that the United States and Great Britain would cooperate in seeking to control all available supplies of uranium and thorium both during and after the war; Bothwell, *Eldorado*, 162–63.

45. Sherwin, *A World Destroyed*, 62; Richard Hewlett and Oscar Anderson Jr., *The New World, 1939–1946: A History of the United States Atomic Energy Commission* (University Park, 1962), 1: 89–170.

46. Sherwin, *A World Destroyed*, 59, 73. The refusal of the American government to share top secret atomic information between December of 1942 and August of 1943 was justified on the grounds that since the United States was carrying out virtually all the costly developmental work, the original partnership was no longer operative. On 13 January 1943 the British and Canadians were informed that information would be passed only if they could "take advantage of this information in this war."

continual source of tension at the three major Manhattan Project sites — Chicago, Los Alamos, and Oak Ridge.[47]

No such drastic security system prevailed at the Montreal laboratory, the focus of the joint Canadian and British atomic program. By the end of 1943 there were over 175 scientists involved with the project, of whom eighty-one were Canadians, eighty-eight were British and four were members of the Free French atomic research team. The interaction of this cosmopolitan collection of scientists was quite good, especially after the appointment in December of 1943 of Dr. J.D. Cockcroft as director of the laboratory. In 1944 the Combined Policy Committee adopted a very supportive approach towards the goals of the Montreal group and responded favourably to most of their requests for information, equipment and materials. Members of the Montreal team also had increased opportunities to consult with American atomic scientists at the major theoretical nuclear research centres — Oak Ridge, Columbia University, and the University of Chicago.[48] Groves' compartmentalized system did, however, influence the type of contact which was legitimate; by this criteria only similar research units were allowed to exchange information. Initially, this presented some problems for visiting Anglo-Canadian scientists because of their more holistic approach to research. In October of 1943, for example, the following warning was issued: "since you are allowed a more general knowledge of the whole problem than American scientists you must be extremely careful in the course of. . . exchange of information."[49] By 1944, however, with the large-scale integration of the Montreal laboratory into the Manhattan Project, what became of paramount concern for General Groves and his staff was the dissemination of critical data about the uranium and plutonium bombs. Accordingly, an agreement was drawn up between General Groves and Dean C.J. Mackenzie in June 1944 to cover interaction between the Montreal laboratory and the Chicago metallurgical facility:

47. Hewlett and Anderson, *New World*. Although Mackenzie and Howe felt that the British were not being reasonable in either their demands for full partnership or their tactics of noncooperation, they did reluctantly agree to support the British position. Indeed, there was also some thought given to utilizing the three major United States-Canadian joint committees (PJBD, Joint War Production Committee, and the Joint Economic Committee) to prod the Americans into a more cooperative stance. NRC, vol. 284, W.A. Akers to Mackenzie, Feb. 1943.

48. Gowing, *Atomic Energy*, 253–90; George Lawrence, *Early Years of Nuclear Energy Research in Canada* (Chalk River, 1980).

49. NRC, vol. 284, W.A. Akers to H. Halban, 5 Jan. 1944; National Archives (Washington), Records of the Manhattan Engineering District (hereafter Manhattan), file "Liaison Montreal," report of meeting, 30 May 1944. The cooperative mood of 1944 was also a great asset for those entrusted with the awesome responsibility of assembling the atomic bombs. In May, the director of Los Alamos, Dr. J.R. Oppenheimer, implored Groves to send the British physicist Rudolph Peierls to Los Alamos in order to expedite implosion research for the plutonium bomb: "We all agree that Peierls has the qualifications for the job, which involves a sense of responsibility and realism rare in theoretical people as well as great mathematical skill." In contrast, Edward Teller was dismissed as being "quite unsuited for this responsibility." Manhattan, 201 series, "Peierls file," Oppenheimer to Groves, 1 May 1945.

> It was pointed out that Dr. Watson and Dr. Huffman were the key American representatives on the staff of the Montreal Group in the position of consultants to Dr. Cockcroft. It was understood that they would have access to all Metallurgical Project information and they would keep themselves informed by means of reports and...would have the responsibility of recommending... visits required by the Montreal Group to Chicago....
>
> General Groves states also that Dean Mackenzie assign a Canadian officer to the project to act as security officer and requested that Major Benbow... not... take direct action on security questions, but that as part of his duties, he would be in a position to keep General Groves up to date on all activities taking place in connection with the Montreal Program.[50]

In July of 1944 the exchange guidelines were further clarified: "it is the intention to interchange all information essential to the construction and operation of the Canadian Pilot Plant and not to interchange information which is irrelevant to such a plant". The Montreal group could, therefore, request data on the Oak Ridge graphite pile and on the "fundamental physics" necessary for the operation of a heavy water pile. Yet anything relating to plutonium, the chemical extraction of plutonium (code named element 49), or its production at the Hanford pile, was declared out of bounds.[51] The report also sought to bring the Montreal laboratory into the elaborate security system of the Manhattan Project. It was decided that the transmittal of written documents across the border would be handled by armed couriers "with no other duties." Most of these men were drawn from military intelligence units in the Chicago area, assisted by officers of the RCMP when they entered Canada. The duties of Major Benlow, the Manhattan Project liaison officer in Montreal, were also clearly specified:

a) To see that the needs of the Montreal Group for information from the United States are met promptly.

b) To see that irrelevant information is not interchanged.

c) To see that a detailed record is kept of all interchange of written documents.

50. Ibid., "Canadian Liaison File," minutes of meeting, 8 June 1944 of a sub-committee of CPC.

51. Ibid., box 21, "Liaison with the Canadians," memo, General Groves, 13 July 1944. On 27 May 1944 the following members of the Montreal group visited the metallurgical laboratory in Chicago: J.D. Cockcroft, H.H. Halban, R.E. Newell, G. Placzek, G. Volkoff, D.W. Ginns, and B. Pontecorvo. The major topics of discussion were shielding, heavy and light water cooling, water activiation, hazards, and "using the pile for producing 23." The American scientists were E. Fermi, W. Zinn, E. Wigner, and L. Alvarez.

d) To see that a log is kept of all interchange of visits.[52]

By January 1945 the major security issue complicating relations between the Montreal group and the Manhattan Project was the status of the four French scientists — H.H. Halban, Jules Gueron, Lew Kowarski, and Bernard Goldschmidt. Because of their expertise in the theoretical aspects of a heavy water nuclear reactor they had become indispensable in the development of the Canadian NRX pilot plant at Chalk River. Yet for Groves they were a serious security risk, largely because of their strong attachment to the French nuclear programme. "The double loyalties of these men present a problem in protective security which increases as the project progresses towards fruition.... They have had access to all reports and details of work in Canada. This would include information on the experimental piles at Chicago and Tennessee and information concerning certain difficulties encountered by the big pile at Hanford." In Groves' opinion, the only effective way to maintain security was to dismiss them immediately from their posts, "placed in confinement in Canada, and not be permitted to communicate with anyone."[53] Fortunately, the more draconian aspects of this policy were not implemented. Nevertheless, the French scientists were soon phased out of the Montreal project, despite the following protest from Dean Mackenzie:

> We are beginning to feel that our stake and contribution in this joint British-Canadian project has been rather submerged in the British-American formal negotiations and as it is not at all improbable that the work in this country will in future be more completely Canadian in reality, I am particularly interested in maintaining good morale and effectiveness in connection with the one phase that is more nearly Canadian than any other. We are aware of the importance of security and offer no objection to the other French nationals being withdrawn but Goldschmidt, in our opinion, presents a different case. He is not interested in phases outside his own work; he is a pure scientist without any interest in the engineering phases....
>
> If Goldschmidt is now removed before the "Hot Lab" at Chalk River is in full operation, it will affect the morale of our Canadian group markedly and

52. Ibid. By December 1944, J.D. Cockcroft, the director of the Montreal laboratory, was becoming exasperated with American-style security, especially when applied to his research team: "I do not fully understand why the U.S. Security people in Montreal are not satisfied with a definite statement that foreigners have been thoroughly investigated by our intelligence people." This included both the European emigré scientists and the Free French. Cockcroft to Mackenzie, 4 Dec. 1944, NRC/NRC, vol. 284, file II.

53. Ibid., "Liaison with the Canadians," memorandum, "The Substance of Recommendations Which Will be Made by Major General Groves," 20 Jan. 1945. The visit of Gueron and Halban to France in October and December 1944 precipitated the crisis, especially since they had both contacted the left-wing French physicist Dr. Joliot and "disclosed information which is thought by the U.S. Security organization to be detrimental to the security of the [Manhattan] Project." "Memorandum on Security Problems Raised by Employment of French Scientists in Canadian N.R.X. Project," 20 Jan. 1945.

> will seriously delay the completion of our plant at a time which is very critical for our internal scientific prestige.[54]

Mackenzie's argument did not sway General Groves, and the request was denied. Less serious, but still troublesome for Groves and his security officers, was the behaviour of a frequent guest from the Montreal Laboratory — Dr. Alan Nunn May. In January of 1945 Groves received the following report from Dr. Walter Zinn, director of the Argonne laboratory:

> Zinn stated that the problem of security would arise since it is inevitable that when a visit is extended over a long period of time, as would be necessary for the accomplishment of the proposed work, slips will occur which compromise the security of matter at the Argonne which are not within the proper purview of the Canadians' knowledge.
>
> As an example of his point, Zinn described an incident which occurred during the visit of A.N. May. The results of experiments performed at Hanford were being given to May who was led to believe the work had been done at Argonne. All went well until a visitor from the Metallurgical Laboratory who did not realize May's status remarked to a group that the work had been done at Hanford. Zinn believes that if a visitor were going to remain at the laboratory for an extended period it would be well to process all visitors to the laboratory who would be likely to innocently violate the rules of interchange.[55]

After May's exposure as a Soviet spy in September of 1945, Groves had additional reason to reflect on the activities of the British physicists:

> His [May's] third, and last visit, occurred between 25 September and 30 October 1944. At that time he carried on extensive work in collaboration with our scientists in a highly secret and important new field. His work resulted in a research report in which he collaborated with an American scientist. May necessarily must have become familiar with the work then going on at the Argonne Laboratory. He also, at this time, probably acquired knowledge of some technical problems which we encountered in the operation of the first Hanford pile.[56]
>
> By this time [October 1944] May had spent more time and acquired more knowledge at the Argonne than any other British physicist. Although I had absolutely no reason to suspect him, I did not like to have him acquire such a wide knowledge of later developments. It is for that reason that in the spring of 1945 I declined to approve a proposed fourth visit of one month's duration. May never returned to the Chicago Laboratory and never visited any other Manhattan District installation.[57]

54. Ibid., Mackenzie to Groves, 26 Dec. 1945.
55. Ibid., "Montreal File," report of special agent, Chicago, to Groves, 29 Jan. 1945.
56. Ibid., "Investigation File," Groves to Senator B.B. Hickenlooper, 12 March 1946.
57. Ibid.

On this occasion, Groves also found it necessary to exonerate any of his Manhattan Project scientists from unlawful or unhealthy association with the British spy: "He [May] had few social contacts with the other scientists although he was generally well liked by them. They have described him as a charming, shy, little man with a dry sense of humor. The American scientists with whom he was in most intimate contact are in my opinion men of unquestioned loyalty and integrity. The revelation of his activities came as a complete shock to them."

iii

The revelations of Soviet espionage had also come as a great shock to the Canadian government. Yet the documents provided by Igor Gouzenko and the evidence obtained through the enquiry of the Royal Commission on Espionage, left little doubt that an extensive Russian espionage system had operated in Canada since 1943. Even the Soviet Union admitted that "certain members of the staff of the Soviet Military Attache in Canada [had] received, from Canadian nationals with whom they were acquainted, certain information of a secret character." How had they obtained these secrets? Did this scientific information substantially assist the USSR in developing its postwar weapons systems?[58]

The first of these questions about sophisticated weapons being produced in Canada was essentially answered by the documents Gouzenko removed from the Soviet embassy. These records showed that by September of 1945 Soviet army intelligence had successfully infiltrated a number of departments and agencies of the Canadian government. Those most affected were the Department of National Defence, the Department of Munitions and Supply, the National Research Council, and the Montreal laboratory. In almost all of these cases the method of Soviet penetration was similar. Scientists, invariably those who held responsible positions, were recruited into the espionage network through an elaborate system of contacts. They were then asked to obtain documents about specific weapons and to convey this material to Soviet officials or to trusted intermediaries. In attempting to explain this "fifth column network," the commission rejected monetary considerations as a major motivating factor; on the contrary, it was the "psychological conditioning" of the accused which led them "to unquestioning obedience" towards their superiors within the Communist movement. The commission also grudgingly admitted that they were "impressed by the elaborate nature of the organization set up by the Russians to obtain information, and by the lengths their agents were prepared to go

58. Royal Commission, Espionage, *Report*, 615–33. The report stated that the NKVD, "which is the secret police of the Soviet Union, have a powerful organization in Canada." It also suggested that there was "some evidence that a Naval System of Intelligence was in process of being organized." Ibid., 24–26.

in the furtherance of that purpose." Certainly the documents which Colonel Zabotin sent to Moscow contained information on a wide range of weapons systems.[59]

But what about the official Soviet statement that almost all of the secret material they had received was "technical data of which Soviet organizations had no need in view of more advanced technical attainment in the USSR [and] the information in question could be found in published works on radio location, etc. and also in the well known brochure of the American J.D. Smyth, 'Atomic Energy'"? In assessing this argument it is necessary to examine specific information the Soviets obtained about each of the major weapons.[60]

On 14 June 1946, Canadian military intelligence received an urgent request from Colonel R.E.S Williamson, the American military attaché in Ottawa. In his letters Williamson indicated that the United States War department were most anxious for specific information "concerning the disclosures of secret material to the alleged agents of the USSR in Canada" under the following headings:

a. Atomic Energy

(1) What has USSR learned about:

(a) construction and operation of uranium piles, used for the production of the atomic explosive, plutonium;

(b) methods of separating the atomic explosive, uranium 238, including engineering difficulties involved;

(c) construction, method of assembly, and operating features of an atomic bomb, including details as to size, weight of uranium 235 or plutonium incorporated as explosive, method of detonating, drawings, etc.;

(d) solution of the many engineering and manufacturing difficulties involved in the manufacturing processes;

(e) processes, rate of production, government control, and destination of products of uranium refinery at Chalk River, Ontario;

59. Ibid., 57–58. Those detained and implicated in the royal commission report for having conveyed scientific information to the Soviets included the following: Israel Halperin (Directorate of Artillery), Raymond Boyer (secretary to the sub-committee on research and development of the NRC Committee on Explosives); David Shugar (Research Enterprises Ltd.); Matt Nightingale (liaison officer between the RCAF and Defence Communications Ltd.); Edward Mazerall (engineer, Radio and Electrical Engineering Division, NRC); and Durnford Smith (researcher in the Microwave Section of the NRC Radio Branch).

60. Ibid., 615–17.

(f) rate of mining of uranium ore from the Eldorado mines on Great Bear Lake and the estimated total quantity of ore available in these mines;

(g) any other data pertaining to atomic bomb development.

(2) Did the Soviets obtain any samples of uranium 235 of plutonium? Did they obtain any plans or drawings knowing bomb construction, manufacturing machinery, etc?

b. Explosives:

(1) What did the USSR learn of methods of manufacture of explosives such as RDX?

c. Canadian Scientific Organization:

(1) What has the USSR learned about the National Research Council of Canada, including its organization and personnel?

(2) Did the Soviets obtain documents from the library of the National Research Council for photographing?

d. Guided Missiles:

(1) What information did USSR obtain on US or British developments in the field of guided missiles?

e. Electronics and Proximity Fuses:

(1) What data was obtained from the Canadians on "the US Navy electronic shell", i.e., proximity fuse? (Of particular interest are the frequency, power and manufacturing details of components, especially the tubes.)

f. Chemical Warfare:

(1) What information did USSR obtain on the German nerve gases?[61]

In addition, on 30 May, the British War Office sent the following telegram: "We are anxious to know complete and exact details of any British military material or documents that may have been compromised to Russia. MI 5 have no details except 'Radar K Band 931'. We would also be interested to have similar information concerning Canadian and U [sic] States equipment. Can you let me have an early report to enable me to take consequential action."

61. PAC, Department of National Defence Records, file TS 711-270-16-1, Colonel R.E.S. Williamson to Colonel W.A.B. Anderson, director of intelligence, Canadian Army, Ottawa, 14 June 1946. Russian interest in Canadian/British and American research efforts in chemical warfare was probably not that intense since they were among the world's leaders in research, and by the early part of 1945 they had captured the highly sophisticated German chemical warfare research centres in East Prussia.

Because of the tight secrecy surrounding the proceedings of the royal commission and the reluctance of the RCMP and the Department of Justice to divulge "sensitive" information, it was not until July of 1946 that officials of Canadian military intelligence could begin to respond to the American and British demands. Even then the special investigative subcommittee which had been appointed under Major C.M. Jervis-Read of the Army Directorate of Armament Development, had difficulty ascertaining "the details of the information compromised."[62]

Atomic "secrets" were understandably the matter of greatest concern. In their attempt to answer the American enquiry of 14 June, Canadian military intelligence relied on four major sources. One was the testimony which J.D. Cockcroft, the former director of the Montreal laboratory, had given before the royal commission:

> Q. Could it be said that he [Alan Nunn May] gave all that he had to give?
>
> A. No. I would say he could have given much more valuable information, or he could have been much more valuable if he had written out a complete report of everything he knew.
>
> Q. He had more to give?
>
> A. Oh! Undoubtedly yes; certainly — I would say so; definitely.

Another source was a secret report of British military intelligence which was based on evidence provided by Alan Nunn May following his arrest and interrogation in England. The British report concluded that the information provided by May "would accelerate the production of bombs by the USSR by approximately one year."[63] The most comprehensive assessment was provided by Dean C.J. Mackenzie in a September 1946 letter to O.M. Solandt, director general of defence research (Army). What makes Mackenzie's response so useful is that it responded point by point to the 14 June letter of the American military attaché. On the "compromise" of atomic secrets Mackenzie had this to say:

> (a) Probably general information about the construction of the small pile at Chalk River but nothing of the operation of any piles or the

62. On 4 July 1946 Douglas Abbott, minister of defence, sent a strongly worded letter to Louis St. Laurent, minister of justice, complaining about the lack of information which his officers and officials had obtained. He particularly stressed the extent that Canada's future military relationship with both the British and Americans was being jeoparidized by the delay in meeting the "most urgent and specific enquiries from the War Office, U.K. and the War Depart. U.S.A.... the fact that many of the items which appear on our 'Secret' list and which may have been compromised were passed to us by the U.K. and U.S.A. justifies their strongly expressed interest." Ibid., Abbott to St. Laurent, 4 July 1946.

63. Ibid., memo, Lieutenant Colonel W.A. Todd, 24 Aug. 1946; ibid., O.M. Solandt to Mackenzie, 11 Sept. 1946. Solandt was somewhat critical of the British report especially since, in making their estimate about the Soviet bomb, they "gave no detail concerning the fact that had been revealed."

construction of full scale piles — in fact, little more than was published in the Smyth report.

(b) Nothing that is not generally known by physicists as Canadians did not work on this project.

(c) Probably the anticipated rate of production [of uranium] was disclosed, but nothing of Goverment control, destination of products, etc., could have been disclosed at that time. It should always be remembered that the Chalk River plant is not a full-scale production plant.

(d) It is possible that a minute quantity of plutonium may have been obtained, but we have no definite knowledge. There has never been at any time any information about the bomb in Canada and no information could possibly have been obtained from this country.

With reference to the methods of separating uranium 235 from uranium 238 Mackenzie asserted that May could not have disclosed any useful information "since Canada did no work on this project." Nor would he have been able to disclose anything about the "construction, method of assembly, and operating features of an atomic bomb."[64] In Washington, General Leslie Groves was telling the same story — an unfortunate leak, but not critical to the American monopoly of atomic bombs. Of course, he had two reasons to minimize the incident: it was his security system which May had outwitted, and he wanted to perpetuate the view that the Soviet Union could not acquire atomic weapons until 1955.[65]

In his report of 19 September C.J. Mackenzie also commented on what secrets the Soviets might have obtained about other weapon systems. Once again he was reassuring:

> Explosives: We have no further knowledge than that disclosed in the Commission report. Guided Missiles: As far as we know, nothing. Electronics

64. Ibid., Mackenzie to Solandt, 19 Sept. 1946.

65. Herken, *Winning Weapon*, 125. Groves based this prediction on the argument that "the real atomic secret consisted of a preclusive monopoly of atomic raw materials and American technological 'know-how'." In a report of March 1946 Groves admitted that May "could have furnished to an unauthorized person small samples of plutonium and U 235 of unknown purity and degree of enrichment since it would be a virtual impossibility to trace the theft of such a small amount." In terms of information, he acknowledged that May would know the following: 1. Most of the research carried on at the metallurgical laboratory, University of Chicago; 2. Some of the technical problems encountered in the building and operation of the Hanford reactor; 3. A degree of awareness "as to our production rates of fissionable materials, both U 235 and plutonium;" 4. "A very limited amount of information with respect to the materials used in the bombs." Groves felt particularly confident that most of the secrets of the bomb were safe. "He [May] would not have been able to secure any such knowledge through legitimate channels. It would have required a breaking down of the compartmentalization rules in each instance where he secured such knowledge". Manhattan Records, "Investigation File," Groves to Senator Hickenlooper, 12 March 1946.

> and Proximity Fuses: As far as we know, nothing. Chemical Warfare: Nothing as far as we know.

However, the technical personnel associated with the development of Sonar/Asdic radar and explosives indicated that in their area of specialty the Soviet espionage operation had been remarkably successful. In Sonar research, for example, a report by Lieutenant Colonel Robert N. Battles of the Royal Canadian Navy Directorate of Electrical Engineering provided a long list of secrets which Colonel Zabotin's spy ring might have obtained:

> *Information Probably Handed Over:*
>
> (1) The function of individual A/S Research and Development Establishments, testing plants and trial bases, in the United States and United Kingdom, together with their relation to the overall Anti-Submarine organization.
>
> (2) General description of the function of audio equipment installed in Naval craft and use of type 1479 as a depth determining equipment.
>
> (3) General description of the application of audio equipment in the defense of harbours and Naval bases.
>
> (4) Information as to general purpose of production test laboratories and location in Canada at Renfrew, Ont.
>
> (5) General information on functions of audio recorder paper and experiments under investigation for its improvement.
>
> *Information Possibly Turned Over*
>
> (1) Situation of Asdic equipment in various classes of ships.
>
> (2) General factors influencing the positioning of Asdic equipment in Naval craft.
>
> (3) General appreciation of tactical use of Asdic equipment and coordination between Asdic detection and the depth charge and hedgehog weapons.
>
> (4) General description of improved A/S type 1447 with description of major changes and new features.[66]

The value of the radar "secrets" obtained by Colonel Zabotin was the subject of a special report which Dr. D.W.R. McKinley submitted to the Royal Commission on Espionage in April of 1946. Drawing upon his wartime experience in the NRC radio division, McKinley discussed the possible military implications of this information:

> Recent research and developments in the microwave region include some details essential to the production of successful and practical radar equipment for military purposes, even though the general techniques deployed are non-

66. Ibid., report of Lieutenant Commander R.M. Battles, 7 Sept. 1946.

> secret and well established. The Armed Services have accordingly asked that the details of these techniques on wave-lengths shorter than 3 centimetres be kept secret. As far as the scientist is concerned the knowledge that an equipment operates on the K band, or 1.25 cm., is of no value unless he also has complete details of how it operates, and in these cases, that means he must have a theoretical and practical description of the detailed apparatus. However, the second reason for security is tactical; if the enemy is aware that we have an equipment operating on 1.25 cm., say, then it is quite possible for him to take steps to "jam", or interfere with, or otherwise nullify the equipment, even though he does not possess anything like sufficient knowledge to build one himself. In this security category are placed operational reports of performance of equipment: if the enemy had full knowledge of the limitations of range or accuracy of the equipment he may conduct his operations so as to take advantage of these limitations.

It was evident, however, that McKinley did not share the Canadian government's concern with scientific secrets, and his report went on to question whether the unfortunate disclosures on the part of his former NRC colleagues were really that serious:

> the security and declassification of information of this nature is a complex interlocking problem requiring simultaneous action by the appropriate bodies in UK, USA, and Canada. The picture is very cloudy due to disagreements, slow action and enforced alterations in status caused by the seemingly inevitable leakages. Incidentally, and though this is probably not the proper place to go on record, it is my own feeling in common with the majority of scientists, that all security restrictions of all scientific matters should now be dropped. The scientific reason for security which was mentioned above only applies in case of war or in anticipation of war.[67]

One of the royal commission's most controversial charges was that Dr. Raymond Boyer, the secretary of the NRC Subcommittee on Explosives, had transmitted top-secret information about RDX to the Soviets through Fred Rose, Communist member of Parliament. The controversy was not, however, so much whether Boyer had given this information to Rose, but rather whether he had the right to act in this way. Boyer's defence was quite simple. The Soviet Union was Canada's gallant wartime ally and it was only the complications associated with the Anglo-American alliance which prevented Canada from carrying out her obligations under the mutual aid agreement:

> Mr. Howe was willing to give it [RDX] to the Russians and was not allowed to do so by the Americans. I felt throughout the work that it was unfortunate that there was not closer scientific liaison in connection with such information between the Russian war effort and ours. In fact I mentioned that a good many times, I was very anxious to see a technical mission, a British-American-Canadian technical mission in Russia and a similar Russian mission in Canada.

67. Royal Commission, Espionage, *Report*, Exhibit, Dr. D.W.R. McKinley, NRC, to Supt. G.E. Rivett-Carnac, Intelligence Branch, RCMP, 3 April 1946.

> I felt it was of great importance that the scientific war effort on the two fronts should be coordinated.[68]

Boyer's case was strengthened when it was revealed that in August of 1944 two Russian explosives experts connected with the Soviet Technical Commission were given a tour of the St. Maurice RDX plant by a high-ranking official of the Department of Munitions and Supply. The following account indicates the extent to which the Soviet scientists found their tour most instructive:

> They [Russian scientists B. Fomin and P. Solodov] had been told the names of the ingredients, the proportions of ingredients and rates of addition to the reaction vessels. He [Cheetham] said they could have taken the temperature of reaction from the reaction vessels, "and I think they did". The Russians had been taking notes all the time and all their questions about the manufacture of RDX had been answered by officials at the plant.... There the Russians saw everything and discussed various aspects of the process, such as quantity of ingredients and other pertinent matters. They also spoke to the plant employees... there had been no question of withholding any information from them. The process was discussed without reservation.[69]

Yet in the end the Canadian government won its case. On 30 January 1948, after three trials, Mr. Justice Wilfrid Lazure of the Quebec Court of King's Bench sentenced Boyer to two years in penitentiary for conspiracy to violate the Official Secrets Act. It was a powerful message to those Canadian scientists who were still involved in top secret military research projects.[70]

iv

There has been a tendency in recent years for scholars to exaggerate somewhat the role of the United States in Canadian defence policy during the Second World War and to underestimate the role of Great Britain. While there is little question that

68. Royal Commission, Espionage, *Report*, 406. At his trial in March of 1947, Boyer explained that his decision to give the formula to Rose was motivated by the fact that a Russian scientific mission was in Canada and that he thought it a good idea for this mission to ask the Canadian government for the method of producing RDX. "I tried to express or show that it was a new method of production we were using in Canada and not a new explosive. I thought Rose would see to it that the Russian mission would continue to put pressure." *Citizen* (Ottawa), 27 March 1947.

69. Ibid., 23 March 1947, "Testimony," Kenneth Cheethan.

70. More specifically, Boyer was accused of violating Sections 3(1), 4(1) (2) (3). His appeal to the Quebec Court of Appeals and the Supreme Court of Canada were both dismissed. He was released from St. Vincent de Paul in July 1950. Those convicted were Raymond Boyer, two years; Fred Rose, six years; David Gordon Lunan, five years; Philip Durnford Smith, five years; Edward Mazerall, four years; Harold Samuel Gerson, five years; Kathleen Willsher, three years; Emma Woikin, two and a half years; and John Soboloff, fined five hundred dollars. Samuel Carr surrendered to the RCMP in 1949 and was subsequently sentenced to six years. Ten of the twenty-two named by the royal commission were therefore convicted.

Canada was profoundly affected by American military planning, the major reason why Canada became so involved in the development of advanced weapon systems was because of our unique military relationship with Great Britain. Between 1940 and 1941 the British decided to share all their scientific military secrets because of their desperate strategic situation, and because they wanted to use Canada in order to gain more effective access to American resources. For the remainder of the war Canada was deeply involved in a trilateral relationship which the country didn't necessarily choose, but which was decreed by the need to win the war. In its complex negotiations with both the American and British governments Canada was well served by its politicians, diplomats, scientists, and soldiers. Particular credit must be given to the effective liaison work of Dean Mackenzie of the NRC, especially in the American-Anglo-Canadian atomic energy project.[71]

There are many reasons for considering the development of atomic weapons within the broader context of Allied cooperation in military technology. The Manhattan Project had some distinct features, but it also had much in common with other advanced weapon systems. For instance, some of the scientific methods and the administrative procedures developed in radar and explosives research were transferred to the Chicago Metallurgical Laboratory and Los Alamos through the auspices of the Office of Scientific Research and Development. Even more important was the 1944 movement of many outstanding American and British physicists from other war projects to Los Alamos in order to expedite the construction of the atomic bomb. The Manhattan Project also benefitted from the security guidelines and counterintelligence methods which were being used to protect radar research at MIT and VT fuse work at Johns Hopkins or chemical warfare testing at Suffield.[72]

During the Second World War Canadian scientists became involved in the development of all the major weapon systems through the medium of agencies such as the National Research Council. For most of these individuals this was an exciting and challenging experience, a chance to play in the scientific "big leagues." Yet involvement in this type of research also meant that Canadian scientists became exposed for the first time to a new set of operating principles that ran counter to traditional scientific freedom of exchange. Instead, they had to function within rules and procedures which sought to protect scientific secrets from enemy agents, and even from our wartime ally, the USSR.[73]

71. Brian Villa, "Canada and Atomic Collaboration; 1941–43," unpublished paper in possession of author. Postwar military planning between Canada and the United States was formally initiated with the 20 May 1946 meeting of representatives from the armed forces of the two countries. These meetings would become more important after 1948 when "the United States was prepared to rebuild its military apparatus to meet the Soviet threat." Joseph Jockel, "The Canada-United States Military Co-operation Committee and Continental Air Defence," *Canadian Historical Review* 64 (September 1983): 352–58.

72. Sherwin, *World Destroyed*, 60–150; Kevles, *Physicists*, 287–340.

73. Eggleston, *National Research*, 200–400; Goodspeed, *DRB; A History of the Defence Research Board of Canada*, 5–60.

But did either the American or Canadian security systems prevent the Soviet espionage system from obtaining top secret information? Alternatively — and this is the crucial question — did the American or Canadian governments believe that keeping the Russians in the dark about their military technology was a more important goal than a speedy end to the war? The evidence provided in this paper suggests that winning the war and retaining the friendship of the Soviet Union were regarded as the most important considerations by both governments. This view was shared by the general public. Between 1943 and 1945 most North Americans regarded the USSR as a gallant ally. In Canada, for example, the National Council for Canadian-Soviet Friendship had branches in eighteen urban centres across the country and an executive which included Sir Ellsworth Flavelle as president and John David Eaton as vice-president. It is in this climate of opinion that the willingness of some Canadian scientists, "persons of marked ability and intelligence," to supply Colonel Zabotin with certain "secrets" must be considered, though not excused. The tragedy of these fellow travellers was that by the time the Royal Commission on Espionage was created in February 1946 the Soviet Union was neither an ally nor a friend. [74]

74. Donald Avery, "Canadian Communism and Popular Front Organizations," paper presented at the meetings of the Canadian Political Science Association, June 1983, Vancouver. Paul Dufour, "Eggheads and Espionage: The Gouzenko Affair in Canada," *Journal of Canadian Studies* (Fall-Winter 1981): 188–98.